

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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FEDERAL COMMUNICATIONS COMMISSION
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In the Matter of)

Revision of the Commission's Rules)

To Ensure Compatibility with)

Enhanced 911 Emergency Calling Systems)

CC Docket No. 94-102

RM-8143

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**COMMENTS OF THE MOBILE AND PERSONAL COMMUNICATIONS
DIVISION OF THE TELECOMMUNICATION INDUSTRY ASSOCIATION**

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EXECUTIVE SUMMARY

TIA supports the improvement of wireless E911 capabilities. Enhancements in quality and reliability of wireless E911 systems will promote safety and welfare for all Americans. However, TIA does not believe that the FCC should invoke an overly-regulatory paradigm in order to achieve these long-lived goals of the Commission. Instead, the Commission should seek a solution that will take advantage of the competitive forces set in motion by the Telecommunications Act of 1996. To that end, TIA suggests that the Commission regulatory scheme that encourages competition and stimulates research and development in this vital area.

TIA's comments focus on two specific issues raised by the Commission in its Further Notice of Proposed Rulemaking -- heightened ALI accuracy and E911 calling capability across different air interfaces. First, TIA urges the Commission to establish a flexible environment for the improvement of automatic location information ("ALI") accuracy above and beyond the 125 meter requirement currently mandated by the rules. Specifically, TIA requests that the Commission abandon its proposal of requiring, within five years, E911 location technology that can be narrowed to 40 feet with 90 percent accuracy in three dimensions. The FCC's proposal is technologically infeasible, unnecessary, and contrary to the deregulatory goals of the 1996 Act. Instead, TIA suggests that the Commission establish a pro-competitive regulatory scheme that allows PSAPs to determine the minimum ALI accuracy required beyond the 125 meter requirement from equipment providers.

Second, TIA maintains that the Commission should not dictate the institution of E911 calling capability across different air interfaces. Currently, wireless systems operate in vastly different frequency bands using distinct channel spacings, transmit/receive separations, bandwidths, and modulations. Present technology cannot support universal E911 calling capability across these dissimilar air interfaces. Worse yet, developments in technology will only exacerbate this problem because system requirements will continue to diverge. Even if the technology were available to allow for universal compatibility of E911 calling capability, its implementation would result in impractically bulky and costly handsets, on the one hand, while providing relatively limited benefits to consumers, on the other.

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**COMMENTS OF THE MOBILE AND PERSONAL COMMUNICATIONS
DIVISION OF THE TELECOMMUNICATIONS INDUSTRY ASSOCIATION**

The Mobile and Personal Communications Division of the Telecommunications Industry Association ("TIA")¹ herewith submits its comments on the Commission's *Further Notice of Proposed Rulemaking* in the above-captioned proceeding.² The *Further Notice* seeks comment on regulations that would improve the capabilities of wireless access to E911 systems beyond the initial requirements specified in the Commission's *First R&O* in this docket. While TIA supports improvement of wireless E911 capabilities, TIA does not believe regulatory mandates are appropriate where fundamental technology development limitations may preclude compliance. Instead, TIA suggests developing a regulatory scheme that encourages competition and stimulates research and development in this vital area.

¹The Telecommunications Industry Association is the association of telecommunications manufacturers. The Mobile and Personal Communications Division of TIA is comprised of four sections which address wireless cellular, PCS, private, and satellite issues.

²Revision of the Commission's Rules To Ensure Compatibility with Enhanced 911 Emergency Calling Systems, CC Docket No. 94-102, FCC 96-264 (July 26, 1996) ("*Further Notice*" or "*First R&O*").

In particular, TIA's comments on the *Further Notice* address two specific issues raised by the Commission. First, TIA urges the Commission to avoid establishing an overly-regulatory environment to upgrade automatic location information ("ALI") accuracy from the 125 meter requirement mandated in the *First R&O*. Instead, TIA suggests the establishment of a regulatory scheme that takes advantage of the increasingly competitive nature of the wireless marketplace to drive improvements in ALI accuracy, as needed by PSAPs. Second, TIA maintains that the Commission should not dictate the institution of E911 calling capability across different air interfaces because such a measure cannot be supported by the technology available for commercial systems for the foreseeable future.

I. BACKGROUND

A. The Commission's *First Report and Order* and *Further Notice of Proposed Rulemaking*

On July 26, 1996, the Commission released its *First R&O* establishing rules seeking to ensure compatibility between wireless networks and enhanced 911 ("E911") systems. In particular, the *First R&O* includes provisions:

- mandating that wireless carriers process and route all 911 calls from mobile handsets to appropriate PSAPs within one year;
- requiring different types of information to be routed to requesting PSAPs, depending upon whether the mobile transmits a "code identification;"
- establishing compatibility between wireless 911 systems and TTY devices within one year;

- dictating that wireless carriers provide cell site location within 18 months using ANI; and
- directing wireless carriers to provide ALI accurate to 125 meters 67 percent of the time using latitude and longitude within 5 years.

All of these requirements, however, are contingent upon the adoption of appropriate funding mechanisms by local PSAPs.

Concurrent with the release of the *First R&O*, the Commission issued its *Further Notice* which sought comment on improving the performance of wireless E911 systems. Specifically, the *Further Notice* requests comment on:

- requiring ALI within 40 feet 90 percent of the time using latitude, longitude, and altitude;
- setting specifications for latency and updating ALI information;
- requiring all PSAPs to accept non-code identified calls; and
- requiring wireless carriers to service calls from any mobile unit.

In effect, the *Further Notice* was intended to pick up where the *First R&O* left off by setting forth a regulatory scheme ensuring the continued development of E911 functionalities.

B. TIA's Petition for Reconsideration and Clarification

On September 3, 1996, TIA petitioned the Commission for reconsideration and clarification of the *First R&O*. While TIA expressed support for the Commission's goal of ensuring compatibility between E911 calling systems and wireless services, TIA,

nevertheless, illuminated several facets of the *First R&O* that require explanation or modification. TIA's petition requested that the Commission:

- delete the MIN definition and modify the "Code Identification" definition to conform to current equipment manufacturing and use practices;
- modify its pANI definition to achieve implementation neutrality;
- clarify the Commission's intent to prescribe only those validation procedures associated with billing of subscriber calls;
- clarify carrier's obligations where a mobile's directory number is not known to the serving carrier;
- allow flexibility to implement TTY/digital wireless E911 compatibility through the use of functional equivalents and defer the TTY compatibility requirement until after standards have been developed and a reasonable implementation timeframe can be discerned;
- permit industry committees to examine the range of factors involved in assessing the performance of a ALI system to achieve a metric for measuring performance that is either implementation and environment independent or allows consideration of environmental effects and provides some empirical means for assessing those effects for a given implementation;³ and,
- broaden location requirements to allow use of UTM coordinates.

TIA also notes that a number of other petitioners have requested that the Commission modify its definition of "covered SMR" for purposes of the E911

³To this end, TIA also recommended modifying Section 20.18(e) to replace the language that reads "within a radius of 125 meters using root mean square techniques" with "within a radius of 125 meters using measurement and compliance procedures as determined by industry standards groups." TIA Comments at 17.

regulations.⁴ TIA intends to support these requests, specifically the argument by the American Mobile Telecommunications Association and Nextel Communications, Inc. that "covered SMRs" should include only those SMR systems with switching capabilities. With these modifications, TIA believes E911 compatibility would be facilitated to the degree technically feasible.

II. DEVELOPING A PRO-COMPETITIVE FRAMEWORK WILL BEST ENSURE THE GOAL OF IMPROVED E911 LOCATION IDENTIFICATION TECHNOLOGY

A. The Targeted Enhanced ALI Goal of 40 Feet with 90 Percent Accuracy In Three Dimensions Requires Precision That Cannot Be Achieved With Terrestrial Systems

The *First R&O* in this docket establishes a minimum ALI accuracy of 125 meters in 67 percent of all cases. While TIA has not opposed requiring 125 meter accuracy, TIA's petition for reconsideration did note fundamental limitations inherent in the ability of ALI systems to achieve precise location identification in a range of conditions and environments. Accordingly, TIA urged the Commission to allow industry to consider alternative accuracy metrics instead of mandating compliance in 67 percent of all cases.

Even before 125 meter ALI has been implemented, the *Further Notice* now proposes that, within five years, covered carriers be required to provide PSAPs with

⁴Petition for Reconsideration of the American Mobile Telecommunications Association, CC Docket No. 94-102 (filed Sept. 3, 1996); Petition for Reconsideration of Nextel Communications, Inc., CC Docket No. 94-102 (filed Sept. 3, 1996); Petition for Reconsideration of the Personal Communications Industry Association, CC Docket No. 94-102 (filed Sept. 3, 1996).

ALI that is capable of locating a mobile caller within a 40 foot sphere, using longitude, latitude, and altitude, for 90 percent of all 911 calls processed.⁵ The Commission seeks comment on the feasibility of its "estimate" that a standard of 90 percent accuracy, within a three dimensional 40 foot radius, could be achieved within the stated period.⁶

TIA does not believe the Commission's estimate is feasible. Providing enhanced ALI in three dimensions requires a geometry of receiver sites that is incompatible with terrestrial mobile radio networks. In effect, to obtain a reasonably accurate altitude measurement, receiver sites would have to be located far above the height above average terrain conceivable for mobile networks -- TIA estimates that sites at even a 1 mile altitude would be insufficient for the required accuracy. Moreover, mobile radio networks are fundamentally incompatible with three dimensional ALI because such networks were designed with two-dimensional frequency re-use in mind. In other words, even if carriers were able to obtain the site altitudes necessary to obtain triangulation data for three dimensional ALI, those sites would have clear propagation paths to a sufficiently large number of cell sites as to render the network unusable due to interference.

⁵*Further Notice*, ¶ 138. The 40 foot accuracy requirement only applies if "(1) a covered carrier receives a request for E911 services from the administrator of a PSAP that is capable of receiving and utilizing the data elements associated with the services; and (2) a mechanism for recovery of costs relating to the provision of such services is in place." *Id.*

⁶*Further Notice*, ¶ 139.

Additionally, dilution of precision due to the vertical requirements will result in failure in achieving the desired accuracy results. Based on a system using cell radii of 3.5 miles and antenna heights of 500 feet,⁷ for example, the vertical dilution of precision ("VDOP") will be on the order of 10 to 50, depending upon the system geometry. Based on a typical VDOP of 30, and a desired altitude error standard deviation of 10 feet (which would support a 33 foot 90 percent of the time vertical performance level), the required time measurement error standard deviation is 340 pico-seconds. In practical terms, assuming a per measurement time error standard deviation of 3.2 microseconds, a measurement rate of 45 milliseconds, and that noise is the only factor to be considered, the averaging required to obtain the desired performance would require 90 million measurements -- approximately 47 days for a typical CMRS receiver.

Even without concerns regarding three dimensional ALI, the accuracy implied in the *Further Notice* may exceed the resolution inherent in CMRS RF channels. For example, despite that the Global Positioning System ("GPS") utilizes a channel bandwidth of 1.25 MHz, one of TIA's members undertook performance measurements -- before selective availability was turned on -- and found that 90 percent accuracy could only be obtained in suburban environments with a radius of 100 feet and in urban highrise environments with a radius of 600 feet. CMRS channels, in contrast, can be as small as 5 kHz, orders of magnitude narrower. Because the channel bandwidth (B)

⁷For these calculations, this system represents close to limit of what can be accomplished; typical systems utilize 100-200 foot antenna heights and smaller cell radii, which would further dilute system precision.

affects the limit on time resolution (T_{\min}) roughly as $T_{\min} = 1/(4B)$, these narrower channels make it even more difficult to separate out paths differing from the line-of-sight (true) path by tens of feet, the proposed accuracy requirement.

In any event, as explained by TIA in its petition for reconsideration, there are also a host of current technical limits that present a formidable barrier to implementation of the Commission's proposal. First, a geometry of receivers must be present that enables triangulation on mobile units. This implies both a certain minimum number of receivers capable of detecting the device, as well as a positioning of the receivers geographically to facilitate triangulation.⁸ Second, the triangulation signal must not be "correlated" with any co-channel interference received by the base station. Correlated interference produces uncertainties that cannot be overcome through multiple measurements and averaging. Third, radio signals suffer from multipath effects that must be separated out to achieve reasonable accuracy due to a limit on a receiver's ability to differentiate between a true "line-of-sight" signal and a reflection. And, as previously discussed, differentiating between such paths for small differences in path lengths is virtually impossible in the typical CMRS radio environment. Overall, this effect is somewhat like finding a true image in a house of mirrors.

Thus, achievement of the Commission's objectives does not appear possible with terrestrial systems in the foreseeable future. The only avenues for achieving the

⁸TIA Petition for Reconsideration at 18. TIA notes that, even with the best designed systems today, there is often difficulty in getting a signal from one transmitter while in-building by a window, much less while in interior spaces or in elevator shafts.

Commission's goals would require non-terrestrial supplements and/or dead reckoning systems.⁹ Even if development of ALI systems envisioned by the Commission were assumed to be physically possible, the cost of the handset modifications and the impact on features that consumers demand -- the form factor and battery life -- would be severely adversely affected. Handset upgrades also would do nothing for the existing installed base of handsets.

In conclusion, at a minimum, implementing enhanced ALI as proposed in the *Further Notice* would require deployment of totally *new* technology, not the simple "upgrading" of Phase I systems. The wholesale scrapping of ALI technology and the deployment of replacement technology will implicate costs that would likely be unrealistically high for PSAPs to bear.

B. In Lieu of Regulatory Mandates, the Commission Should Develop a Pro-Competitive Framework for Achieving Increased ALI Accuracy

TIA believes that, due to the inherent unpredictability of technological developments, enhanced ALI accuracy -- above and beyond the 125 meter accuracy already required -- should not be mandated by regulation. That being said, however, TIA does believe that the Commission can meet its policy goals and ensure the optimal development of ALI technology. Specifically, TIA recommends removing impediments

⁹Non-terrestrial supplements, of course, would not work for in-building applications due to the requirement of maintaining "line-of-sight" with satellites. Indeed, to achieve ALI in three dimensions using GPS, a minimum of *four* satellite views is necessary.

to a competitive enhanced ALI marketplace and allowing the market to drive further improvements in technology. This action would also be consistent with the 1996 Act's goal of establishing "a pro-competitive, de-regulatory national policy framework" for the United States telecommunications industry.¹⁰

There is no need to dictate, on the federal level, what the acceptable level of enhanced ALI accuracy should be. Rather, PSAPs are uniquely able to determine the relative costs and benefits of deploying advanced ALI systems for the specific needs of their respective jurisdictions. PSAPs can, based upon their experience, determine whether increased ALI accuracy should be prioritized among other needed upgrades to their communications and safety-of-life systems. PSAPs are in the best position to identify what "accuracy" means in a given context and what value they would place on increased accuracy. If a PSAP determines that there is no value in additional accuracy in its jurisdiction, the Commission should not place such obligations on carriers.

PSAPs can also better assess what local taxpayers are willing to bear to achieve more optimal ALI performance. Adopting federal regulatory standards for ALI accuracy would leave no room for the PSAPs or the local citizens to exercise their will. This would be manifestly contrary to the public interest.

Instead, the Commission's regulatory scheme should provide for competitive procurement of advanced ALI systems. At present, a third party (the carrier) is in the middle of a transaction between a purchaser (the PSAP) and an equipment provider.

¹⁰S. Conf. Rep. No. 104-230, 104th Cong., 2nd Sess. 1 (1996).

This situation places the purchasing decision in the hands of an entity that is not paying for the product and skews the natural market forces. Removing the carrier-middle man will provide for a competitive procurement market that will allow manufacturers to directly address PSAP needs. Elimination of the middle man will also allow PSAPs to directly specify and work with manufacturers to obtain the systems that best suit their budgets and needs. Manufacturers would, therefore, be required to demonstrate and prove out their claims in the context that is most important to the PSAP -- its local jurisdictional area. Such robust competition will stimulate innovation, increase choice, and ensure that ALI technologies are improved to the full extent technically feasible. TIA requests that the Commission craft regulations that will spur such competition.

Adopting a competitive model for upgrading of ALI systems will also promote regulatory efficiency. One example of this is the fact that TIA's competitive model will obviate the need to establish additional FCC standards (*e.g.*, latency time frames, methods for handling non-code identified calls, and updating features). These additional requirements could be specified, if desired, by PSAPs.¹¹ TIA's proposal for ALI updating will also eliminate the need for FCC monitoring to ensure carriers are deploying the latest technology, because competition will ensure that capabilities are matched to the needs and requirements of local PSAPs. Because a pro-competitive regulatory framework for advanced ALI would require only minimal government

¹¹To achieve some degree of consistency and allow cost efficiencies in volume production, PSAPs operating in similar environments and with similar needs should be strongly encouraged to define compatible procurement requirements and work jointly with manufacturers.

oversight, the Commission could allocate its resources to other areas where they are genuinely required.

As a final matter, achieving a competitive market for ALI technology would not require onerous regulations. TIA recommends that the Commission take the following steps in order to promote the goal of accurate ALI while, at the same time, utilizing FCC resources efficiently: (1) encourage the development of standardized interfaces to allow PSAPs to upgrade ALI systems and receive advanced ALI information on a technology-neutral basis; (2) require only that wireless carriers cooperate in good faith with PSAPs to implement ALI systems procured through a competitive process; (3) allow for joint agreements between different PSAPs and wireless carriers to fund deployment of more accurate ALI systems; and (4) encourage PSAPs to collectively develop standardized industry guidelines for ALI procurements.

III. REQUIRING E911 CALLING CAPABILITY ACROSS DIFFERENT AIR INTERFACES IS NOT TECHNICALLY FEASIBLE

The Commission's *Further Notice* also seeks comment on achieving broader compatibility across air interfaces. Specifically, the Commission, *sua sponte*, requested comment on a broad proposal for requiring wireless 911 service to be available and accessible wherever a qualifying mobile system is present. The Commission asks whether it is desirable to establish "arrangements and procedures" under which all 911

calls could be handled through any available service.¹² As TIA discusses below, for technical and practical reasons, this proposal should not be adopted.

First, wireless systems operate in vastly different frequency bands using different channel spacings, transmit/receive separations, and bandwidths. For example, wireless system operating ranges can be as low as 220 MHz and as high as 1.9 GHz. Channels come in an assortment of sizes, including 5 kHz, 12.5 kHz, 25 kHz, 30 kHz, 1.25 MHz and even 10 MHz for some spread spectrum systems. Developing a competitively priced and sized consumer radio that can seamlessly scan and utilize this range of radio characteristics is simply not possible given current technology. For example, the general rule of thumb is that radios can be tuned to only +/- 10 percent of the center frequency of operation. Based on this rule, a commercial 220 MHz radio simply cannot be designed to utilize 1.9 GHz frequencies.

Second, even if a radio can be tuned to the proper frequency, wireless systems utilize a range of basic modulation techniques. These modulation techniques (*e.g.*, FDM, TDM, spread spectrum) each represent radio interfaces that necessitate completely different front ends for mobile units. These techniques also do not represent the "final" word in modulation techniques -- the vast panoply of radio techniques almost defies cataloging and is, by nature, open-ended. Thus, even if a radio could decode all of today's modulation formats, it may not be able to decode what is deployed tomorrow.

¹²*Further Notice*, ¶ 147.

Indeed, even for cellular systems where a basic compatibility standard once existed, system implementations are now deviating (*e.g.*, N-AMPS, CDMA, digital TDMA) and may no longer be fully compatible. Furthermore, even for basic analog systems, as TIA documented in its original comments, some E911 types of information cannot be provided in any event.

Thus, to achieve the Commission's stated goals, mobile units would be required to incorporate multiple radios, requiring the replacement of 42 million cellular radios (and more millions of other CMRS radios).¹³ Even if multiple radios could be economically combined into a single handset, a digital signal processor front end would be required to adaptively select a modulation scheme. Such sophisticated systems are beyond the range of technology for commercial implementations and will continue to be for the foreseeable future. While dual mode radio handsets are being developed for limited purposes (*e.g.*, cellular/PCS1900 compatibility or cellular/wireless PBX compatibility), these units typically are restricted to analogous radio formats or utilize multiple radios. Extending this concept to cover all wireless systems would result in handset that is simply too large and too expensive.

At the same time, the benefits that would be achieved by universal compatibility are exceedingly limited and the costs run contrary to long established policies of the Commission. The suggestion to develop a universal air interface reverses a long history

¹³These figures, of course, do not include the replacement of all CMRS radios produced in the many years that it will take to develop the appropriate technology for such universal operation.

of promoting innovation in wireless systems.¹⁴ For example, the Commission expressly declined to adopt interface standards for PCS systems or between other mobile systems.¹⁵ The Commission's proposed action is also at odds with the Commission's prior decisions allowing cellular carriers to deploy alternative cellular technologies.¹⁶ To avoid inconsistent results, the FCC should allow the marketplace to "determine which digital protocols will survive."¹⁷

Furthermore, carriers' networks are expanding and dead spots are gradually being eliminated, which means that universal E911 access, to the extent feasible, is already emerging.¹⁸ Over time, these systems will be built out over greater and greater

¹⁴In 1993, Congress amended the 1934 Communications Act in a manner that initiated major revisions in the statutory system of licensing and regulating wireless telecommunications services. See Omnibus Budget Reconciliation Act of 1993, Pub. L. No. 103-66, Title VI, § 6002 ("Budget Act"), codified in principal part at 47 U.S.C. § 332, as amended. In part, the Budget Act sought to promote marketplace competition and expand innovative use of spectrum by the private sector. Even the Budget Act's development of a competitive bidding methodology is said to promote "the development and rapid deployment of new technologies, products and services for the benefit of the public." 47 U.S.C. § 309(j)(3)(A). The goal of continual innovation has not, and should not, be abandoned.

¹⁵See, e.g., Amendment of the Commission's Rules to Establish New Personal Communications Services, GN Docket No. 90-314, Memorandum Opinion and Order, 9 FCC Rcd 4957, 5021-22 (1994).

¹⁶Amendment of the Commission's Rules to Permit Flexible Service Offerings in the Commercial Mobile Radio Services, First Report and Order and Further Notice of Proposed Rulemaking, FCC 96-283, WT Docket No. 96-6 (August 1, 1996) ("*Flexible CMRS Order*").

¹⁷*Further Notice*, ¶ 147.

¹⁸New systems are now being authorized on a wide-area basis that can provide competition in geographic coverage, stimulating growth.

areas. As greater build out is being accomplished, the chance that service will not be available in a specific location will continue to dwindle.¹⁹ The Commission should adopt a forward looking view that realizes this market reality, and then regulate accordingly. The Commission should not seek to correct the problem of "dead spots" because such regulation would be short-lived and no doubt excessive. Because the wireless market will correct the problem, the market should be given that opportunity.

IV. CONCLUSION

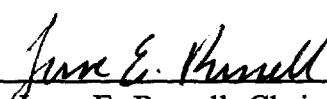
Although the goal of the *Further Notice* is to promote further improvements in the capabilities of wireless access to E911 systems, it seeks this end through a strictly regulatory approach, ignoring the technological limitations that could prevent compliance by carriers. TIA asserts that necessary improvements of wireless E911 capabilities can be made through a flexible approach that avoids the outdated practice of establishing stringent federal mandates. Therefore, as an alternative to the Commission's plan, TIA suggests that the FCC develop a regulatory scheme that stimulates competition and encourages research and development. Specifically, TIA suggests the establishment of a regulatory scheme that takes advantage of the increasingly competitive nature of the wireless marketplace by allowing individual PSAPs, rather than the government, to

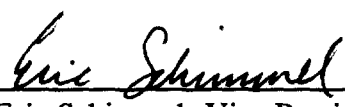
¹⁹To the extent that there are areas that are not served by one carrier after "full" build-out, the likelihood is that population densities will not support coverage by any other carrier. Thus, under those circumstances, the benefits of a "universal" air interface be inconsequential.

determine local ALI needs. Also, TIA requests that the Commission avoid establishing rules that would mandate E911 calling capability across different air interfaces.

Respectfully submitted,

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